

AD-A284 395



USAARL Report No. 94-36



**Aviation Epidemiology Data Register:
Gender-Specific Attrition From the Trained
U.S. Army Aviator Cohort of 1988**

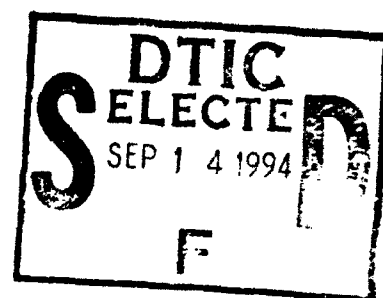
By

94-29845



2388

**Samuel G. Shannon
Kevin T. Mason**



Aircrew Protection Division

and

Jennifer P. Harper

Aircrew Health and Performance Division

July 1994

DTIC QUALITY INSPECTED 3

Approved for public release; distribution unlimited.

94 9 13 129

**United States Army Aeromedical Research Laboratory
Fort Rucker, Alabama 36362-0577**

Notice

Qualified requesters

Qualified requesters may obtain copies from the Defense Technical Information Center (DTIC), Cameron Station, Alexandria, Virginia 22314. Orders will be expedited if placed through the librarian or other person designated to request documents from DTIC.

Change of address

Organizations receiving reports from the U.S. Army Aeromedical Research Laboratory on automatic mailing lists should confirm correct address when corresponding about laboratory reports.


Disposition

Destroy this document when it is no longer needed. Do not return it to the originator.

Disclaimer

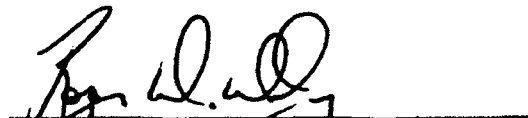
The views, opinions, and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other official documentation. Citation of trade names in this report does not constitute an official Department of the Army endorsement or approval of the use of such commercial items.

Reviewed:

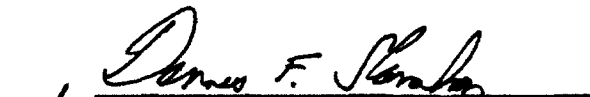


KEVIN T. MASON
LTC, MC, MFS
Director, Aircrew Protection
Division

Released for publication:



ROGER W. WILEY, D.D., Ph.D.
Chairman, Scientific
Review Committee



DAVID H. KARNEY
Colonel, MC, SFS
Commanding

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION Unclassified			1b. RESTRICTIVE MARKINGS		
2a. SECURITY CLASSIFICATION AUTHORITY			3. DISTRIBUTION / AVAILABILITY OF REPORT Approved for public release, distribution unlimited		
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE					
4. PERFORMING ORGANIZATION REPORT NUMBER(S) USAARL Report No. 94-36			5. MONITORING ORGANIZATION REPORT NUMBER(S)		
6a. NAME OF PERFORMING ORGANIZATION U.S. Army Aeromedical Research Laboratory		6b. OFFICE SYMBOL (If applicable) SGRD-UAD-IE	7a. NAME OF MONITORING ORGANIZATION U.S. Army Medical Research, Development, Acquisition and Logistics Command		
6c. ADDRESS (City, State, and ZIP Code) P.O. Box 620577 Fort Rucker, AL 36362-0577			7b. ADDRESS (City, State, and ZIP Code) Fort Detrick Frederick, MD 21702-5012		
8a. NAME OF FUNDING / SPONSORING ORGANIZATION		8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER		
8c. ADDRESS (City, State, and ZIP Code)			10. SOURCE OF FUNDING NUMBERS		
PROGRAM ELEMENT NO. 62787A		PROJECT NO. 30162787A878	TASK NO. HC	WORK UNIT ACCESSION NO. 144	
11. TITLE (Include Security Classification) Aviation epidemiology data register: Gender-specific attrition from the trained U.S. Army aviator cohort of 1988					
12. PERSONAL AUTHOR(S) Samuel G. Shannon, Kevin T. Mason, and Jennifer P. Harper					
13a. TYPE OF REPORT Final		13b. TIME COVERED FROM _____ TO _____		14. DATE OF REPORT (Year, Month, Day) 1994 July	
15. PAGE COUNT 12					
16. SUPPLEMENTARY NOTATION					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP	Epidemiology, database, female, aviator, attrition		
06	05				
05	02				
19. ABSTRACT (Continue on reverse if necessary and identify by block number)					
<p>Women have been involved in U.S. Army aviation for more than two decades. Little has been written about the integration of women into this traditionally male occupation. One indicator of successful integration of women is their retention rate in aviation service. The Aviation Epidemiology Data Register was queried to find out the attrition rate among trained U.S. Army male and female aviators from 1988 to 1992. Results: In the trained aviator cohort of 1988, male aviators were significantly older than female aviators (Mantel-Haenszel χ^2, $p < 0.001$), whatever the component of service. The crude attrition rate for all age groups was 55.4 percent (11847 of 21395) for males, compared to 54.1 percent (265 of 490) for females. Based on male attrition and after controlling for the age difference between male and female aviators, the observed attrition of females (265) exceeded the expected attrition (243) by 22 females (9.1 percent excess attrition). For the age groups 18 to 44 years old, there was a significantly higher risk for attrition among female aviators (Mantel-Haenszel OR=1.23, CI_{0.95}=1.025,1.470). This increased attrition rate was found primarily in the age groups of 18 to 34 years old. The cause for the observed excess attrition of female Army aviators is unknown and requires further study of factors affecting retention in aviation service.</p>					
20. DISTRIBUTION / AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION Unclassified		
22a. NAME OF RESPONSIBLE INDIVIDUAL Chief, Science Support Center			22b. TELEPHONE (Include Area Code) 205-255-6907		22c. OFFICE SYMBOL SGRD-UAX SI

Acknowledgement

We acknowledge LTC Charles Salter, Director, Aircrew Health and Performance Division, USAARL, for assigning Jennifer Harper to the Aircrew Protection Division as a student assistant on this project. Mary Gramling and Udo Nowak edited the final draft. Thanks to all of them.

Accession For	
NTIS CRA&I	<input checked="checked" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	

=====

This page intentionally left blank.

=====

Table of contents

	Page
List of tables	1
List of figures	2
Background	3
Aviation Epidemiology Data Register	4
Method	4
Results	5
Discussion	7
Conclusions	8
Recommendations	8
References	9
Appendix A. Table and figure supplement	10

List of tables

Tables

1. Number and percent female U.S. Army aviators from 1986 to 1992	3
2. Gender-specific attrition from aviation service	6
3. Age-stratified prevalence of attrition from the 1988 aviator cohort	7
A-1. U. S. Army aviators, by military component and gender, from 1986 to 1992	10

List of figures

Figures

1. Gender-specific age distribution of all Army aviators in 1988	5
A-1. Gender-specific age distribution of active duty aviators in 1988	11
A-2. Gender-specific age distribution of USAR aviators in 1988	11
A-3. Gender-specific age distribution of ARNG aviators in 1988	12

Background

Although women have piloted balloons and aircraft since the 1780s, U.S. Army aviation did not begin training female rotary wing aviators until 1973 (Ludowese, 1992; Brooks, 1990). From 1973 until 1993, women were restricted to flying noncombat aviation missions. Today, women may train and fly combat aviation missions, expanding their aviation career opportunities.

Armywide during 1970 to 1988, the percentage of female soldiers increased by more than sevenfold to 11 percent from 1.5 percent (Defense Manpower Center, 1989). Between 1986 and 1988, the number of female Army aviators increased by 79 percent to 483 from 270 (Mason and Shannon, 1994). Despite this increase, women accounted for only 2.49 percent of all Army aviators in 1992. Since 1988, the number and percentage of female aviators in the Army have not changed much (Tables 1 and A-1).

Table 1.
Number and percent female U.S. Army aviators from 1986 to 1992*.

Year	1986	1987	1988	1989	1990	1991	1992
Number	270	457	483	499	494	492	475
Percent	1.44	2.14	2.22	2.33	2.34	2.34	2.49

* Computed from data in Mason and Shannon, 1994.

The cost of training an Army aviator ranges from \$225,000 to more than \$1,000,000, depending on the type of aircraft flown. To recoup these costs, federal regulations require a period of mandatory service obligation for each trainee. Since 1974, the length of this service obligation has varied from 4 to 8 years (Office of the Law Revision Counsel of the House of Representatives, 1990). Given these significant costs, personnel managers need information on attrition from service to plan training budgets.

We wanted to find out if the male and female attrition rates from U.S. Army aviator duties are significantly different. This study uses the Aviation Epidemiology Data Register to follow the trained U.S. Army aviator cohort of 1988. An estimate of gender-specific attrition was derived by determining who left aviation service by failure to maintain medical certification for Army flying.

Only one article specifically addressing attrition among female aviators was identified. A study of U.S. Navy pilots reported the Navy's experience was that the retention rate for females was greater than for males, 53 percent versus 38 percent (Hutton, 1990). The method on how these rates were derived was not described. Analysis of confounders, such as age, was not done.

Hutton said that women made excellent aviators with good safety records. They maintained high degrees of motivation and training success with appropriate flying aggressiveness. Although Navy women could not match male strength in ground testing, women had identical abilities in all modes of flying, including combat maneuvers. Women were helping to fill the void left by a declining male applicant pool.

Other authors compared gender-specific performance during flight training (Siem and Sawin, 1990; Blower, Dolgin, and Shull, 1990). Poor performance in flight training is a factor contributing to the total attrition rate. One study reported that while there were slight scholastic differences between males and females entering flight school, gender did not predict failure during flight training. The authors concluded that once candidates were admitted into flight school, scores from prematriculation testing were not predictors of success or failure in flight training (Blower, Dolgin, and Shull, 1990).

Aviation Epidemiology Data Register

Data was obtained from the Aviation Epidemiology Data Register (AEDR). The AEDR is a family of databases storing medical history and physical parameters of student and trained aviators. One component is a flying duty medical examination (FDME) database. All U.S. Army aviators and flight training applicants are required to submit a FDME upon application, and then annually within 90 days of the end of their birth month (Department of the Army, 1989). Another component is the waiver and suspension file (WSF), a mortality and morbidity index of flight physical disqualifications, casualty reports, and aeromedical board outcomes. The WSF references a medical document archive, containing the details of WSF cases.

Method

All AEDR FDME records for trained Army aviators completed between 1 January 1988 and 1 March 1994 were extracted. A cohort of trained aviators was compiled for the calendar year 1988 based on a FDME being accomplished in that year. Civilian aviators were excluded. The gender, age, and component of service were determined. If an aviator had an FDME in 1993, and/or early 1994, they were counted as remaining in aviation service. Otherwise, they were counted as lost to aviation service due to failure to maintain medical certification to fly Army aircraft.

Univariate analyses were derived with SAS® PROC FREQ statistical software (SAS Institute, 1993). The data was stratified by gender, age, and component of service. Gender-specific attrition was cross-tabulated into 5-year age groups based upon an individual's age in 1988. Expected female attrition was calculated from observed male attrition rates. Expected female attrition rates were compared to observed female attrition rates.

Results

In the 1988 trained aviator cohort, male aviators were significantly older than female aviators (Mantel-Haenszel χ^2 , $p < 0.001$), whatever the component of service. Figure 1 and Figures A-1 through A-3 show the cumulative percentage of male and female aviators by age for each service component. Fifty percent of female aviators were 28 years or older, compared with 80 percent of males. Only 5 percent of female aviators were 35 years or older, compared to 51 percent of male aviators. By age 40, the differences are more striking, with only 1.4 percent of female aviators 40 years or older compared to 25 percent of male aviators.

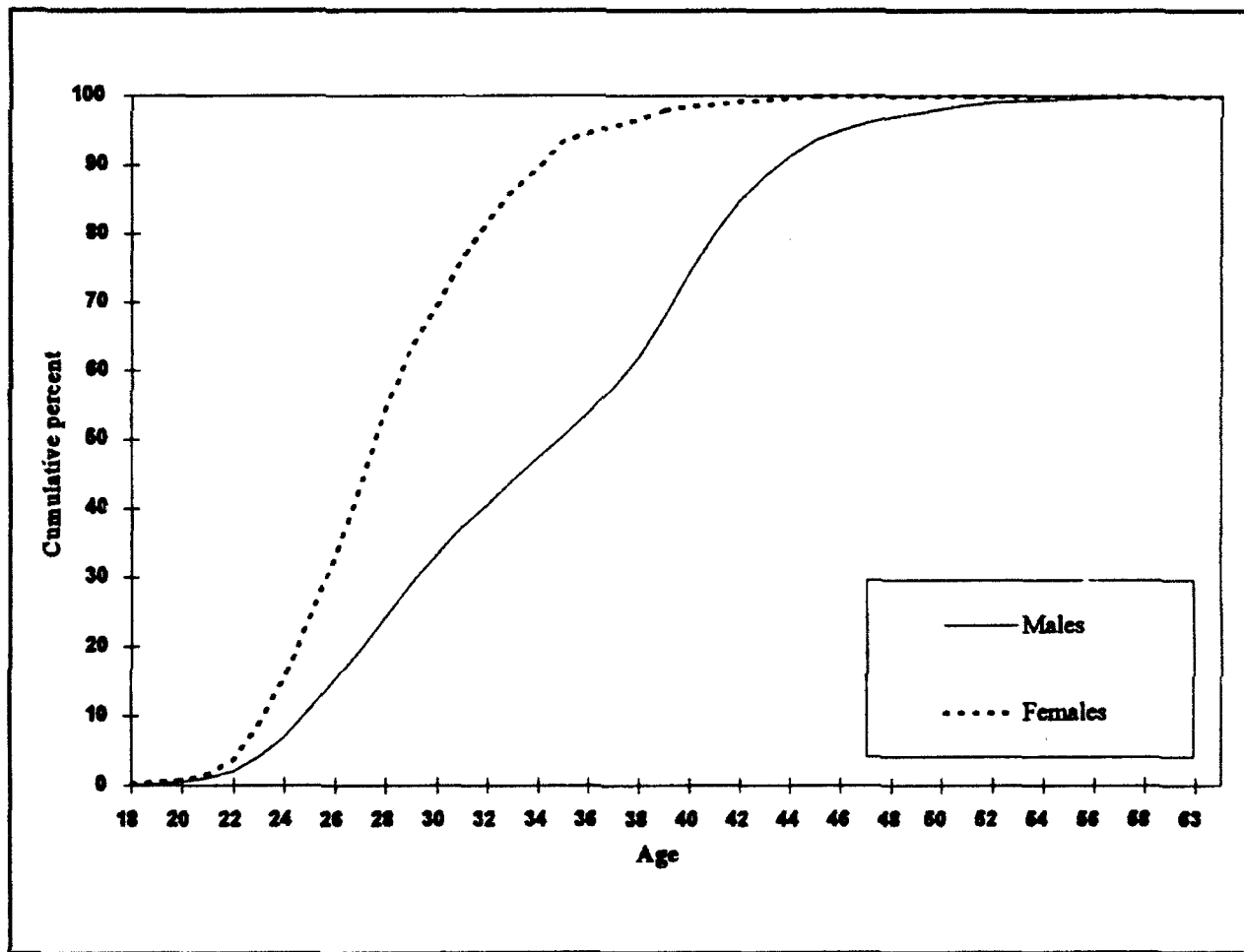


Figure 1. Gender-specific age distribution of all aviators in 1988.

Table 2 shows the attrition from aviation service stratified by the aviator's age in 1988. The ages were unknown in 15 males excluded from this table. The overall attrition rate for male aviators was 55.4 percent (11847 of 21395) compared to 54.1 percent (265 of 490) for females. Based on male attrition and after controlling for the age difference between male and female aviators, the observed attrition of females (265) exceeded the expected attrition (243) by 22 females (9.1 percent).

Table 2.
Gender-specific attrition from aviation service.

Age	Males		Females			
	1988	Observed attrition	1988	Observed attrition	Expected attrition	Excess attrition
18-24	1505	739	76	41	38	3
25-29	4755	2319	235	128	116	12
30-34	3903	1797	127	68	60	8
35-39	4394	2387	42	22	22	0
40-44	5005	3265	9	5	6	-1
45-49	1313	919	1	1	1	0
50-54	413	317	0	0	0	0
55-59	105	102	0	0	0	0
>59	2	2	0	0	0	0
Total	21395	11847	490	265	243	22

Table 3 shows the age-stratified prevalence of attrition for selected age groups that had sufficient numbers for a comparison of male and female attrition from aviation service. Overall for the age groups 18 to 44 years old, there was a significantly higher risk for attrition among female aviators (Mantel-Haenszel OR=1.23, CI₉₅=1.025,1.470). This increased risk was found primarily in the age groups of 18 to 34 years old.

Table 3.
Age-stratified prevalence of attrition from the 1988 aviator cohort.

Age Group	Total Population			Males			Females			Odds ratio
	<i>n</i>	<i>Loss</i>	%	<i>n</i>	<i>Loss</i>	%	<i>n</i>	<i>Loss</i>	%	
18-24	1581	780	49.3	1505	739	49.1	76	41	54.0	1.22
25-29	4990	2447	49.0	4755	2319	48.8	235	128	54.5	1.25
30-34	4030	1865	46.3	3903	1797	46.0	127	68	53.5	1.35
35-39	4436	2409	54.3	4394	2387	54.3	42	22	52.4	0.93
40-44	5014	3270	65.2	5005	3265	65.2	9	5	55.6	0.67
Overall	20051	3270	53.7	19562	10507	53.7	489	264	53.7	1.23*

* Mantel-Haenszel OR (Kahn and Sempos, 1989).

Discussion

Female aviators are significantly younger than male aviators. One reason is that female aviators entered Army aviation in proportionately larger numbers only in the last decade. Few have reached their 20-year retirement. In contrast, about 25 percent of male aviators have been in aviation service since the Vietnam War and are now eligible for retirement.

Since female aviators as a group have not reached retirement age, we would expect the total number of female aviators to be increasing continuously into this decade. However, a previous population study (Mason and Shannon, 1994) showed the total number of U.S. Army female aviators peaked in 1989 and has been declining. During the same interval, the number of male aviators also peaked and has been declining. However, this study documents U.S. Army female aviators are leaving aviation service in greater numbers than expected compared to male aviators, even when controlling for differences in age distribution. Female aviators who are less than 35 years old are at highest risk for age-adjusted, excess attrition from aviation service. The cause of excess attrition among female aviators is unknown.

Aviation is a combat arms asset. With U.S. laws excluding women from combat missions, women aviators had less opportunities in aviation service due to restrictions, than Army women in nonaviation units who had a broader choice of noncombat duties, such as medical care and clerical support. This might account for some observed differences in percentages of women serving in Army occupations.

Conclusions

Female aviators have entered U.S. Army aviation service since 1973, but most entered aviation service in the last decade. Since less than 1 percent of female Army aviators have reached retirement age, we would expect the number of female aviators to increase until a steady state between recruitment, retention, and retirement is attained. However, the number of female aviators has been decreasing since 1989 (Mason and Shannon, 1994). Due to Army force reductions, the number of male aviators also has been declining since 1989. Are female aviators attriting from aviation service at the same rate as male aviators?

In the trained aviator cohort of 1988, male aviators were significantly older than female aviators (Mantel-Haenszel χ^2 , $p < 0.001$), whatever the component of service. The crude attrition rate for all age groups was 55.4 percent (11847 of 21395) for males, compared to 54.1 percent (265 of 490) for females. Based on male attrition and after controlling for the age difference between male and female aviators, the observed attrition of females (265) exceeded the expected attrition (243) by 22 females (9.1 percent excess attrition). For the age groups 18 to 44 years old, there was a significantly higher risk for attrition among female aviators (Mantel-Haenszel OR=1.23, CI_{0.95}=1.025, 1.470). This increased attrition rate was found primarily in the age groups of 18 to 34 years old. The cause for the observed excess attrition of female Army aviators is unknown and requires further study of factors affecting retention in aviation service.

Recommendations

Understanding the composition of our work force is helpful in planning for recruitment, training, and retention of aviation personnel, and for the development of aviation equipment. We believe that the opportunities to become a female aviator in the U.S. Army will increase, even when the total military force is being reduced significantly. Future aircraft designs will fit a wider range of female anthropometric sizes. Today, women fly most Army combat- and support-aviation missions. But controversy still exists since we do not know if society is ready to accept women in expanded combat roles and Selective Service. We do not know if women can be attracted to and retained in combat aviation in sufficient numbers to bring the percentage of women in aviation up to the percentage of women in the total Army.

Further work is required to understand and correct the excess attrition of trained female aviators. The gold standard is to conduct a prospective study. We would develop a special database to assay, store, and characterize a broader spectrum of factors not found in the medically-oriented AEDR. We would follow female aviators and matched male aviators through training, aviation service, and after separation from Army aviation service. This approach is expensive and will take many years to reach conclusions. An inexpensive alternative is to conduct a retrospective life table analysis of a cohort of aviators exposed to a similar experience, such as a class of aviator graduates. Analysis of AEDR data might show gender-specific differences that contribute to gender-specific excess in attrition, such as pregnancy.

References

- Blower, D. J., Dolgin, D. L., and Shull, R. N. 1990. Naval aviation selection test scores and female aviator performance. Recruiting, selection, training, and military operations of female aircrew. Neuilly-sur-Seine, France: Advisory Group for Aerospace Research and Development. AGARD-CP-491:6-1 to 6-5.
- Brooks, C. J. 1990. A brief introduction to the history of women in aviation. Recruiting, selection, training, and military operations of female aircrew. Neuilly-sur-Seine, France: Advisory Group for Aerospace Research and Development. AGARD-CP-491:I-1 to I-3.
- Defense Manpower Center. 1989. Army manpower data. Arlington, VA: Defense Manpower Center, Project No. M001443.
- Department of the Army. 1989. Medical fitness standards. Washington, DC: Army Regulation 40-501.
- Hutton, L. V. 1990. The integration of women into U. S. Navy aircrew training and squadron assignments. Recruiting, selection, training, and military operations of female aircrew. Neuilly-sur-Seine, France: Advisory Group for Aerospace Research and Development. AGARD-CP-491:1-1 to 1-5.
- Ludowese, J. C. 1992. Women in Army aviation: Changing paradigms. Army aviation digest. November/December, pp 45-48.
- Kahn, H. A., and Sempos, C. T. 1989. Statistical methods in epidemiology. New York, NY: Oxford University Press.
- Mason, K. T., and Shannon, S. G. 1994. Aviation epidemiology data register: Age distribution of U.S. Army aviators by gender and component. Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory. USAARL Technical Report 94-4.
- Office of the Law Revision Counsel of the House of Representatives. 1990. The United States Code of Law. Washington, DC: United States Government Printing Office. Chapter 37, title 10, Section 653a.
- SAS Institute. 1993. SAS® PROC FREQ Statistical software. Cary, NC: SAS Institute.
- Siem, F. M., and Sawin, L. L. 1990. Comparison of male and female USAF candidates. Recruiting, selection, training, and military operations of female aircrew. Neuilly-sur-Seine, France: Advisory Group for Aerospace Research and Development. AGARD-CP-491:5-1 to 5-7.

Appendix A.

Table and figure supplement.

Table A-1.

U. S. Army aviators, by military component and gender, from 1986 to 1992*.

Year	Active duty		Army Reserve		National Guard		Totals	
	Male	Female	Male	Female	Male	Female	Male	Female
1986	12,169	204 (1.65%)	1,693	22 (1.28%)	4,619	44 (0.94%)	18,481	270 (1.44%)
1987	13,054	323 (2.41%)	2,674	61 (2.23%)	5,626	73 (1.28%)	21,354	457 (2.14%)
1988	12,380	321 (2.53%)	2,751	82 (2.89%)	6,115	80 (1.29%)	21,246	483 (2.22%)
1989	12,187	327 (2.61%)	2,570	77 (2.91%)	6,138	95 (1.52%)	20,895	499 (2.33%)
1990	12,074	319 (2.57%)	2,473	69 (2.71%)	6,103	106 (1.71%)	20,650	494 (2.34%)
1991	12,439	330 (2.58%)	2,003	66 (3.19%)	6,126	96 (1.54%)	20,568	492 (2.34%)
1992	11,116	306 (2.68%)	1,779	62 (3.37%)	5,727	107 (1.83%)	18,622	475 (2.49%)

* Extracted from data in Mason and Shannon, 1994.

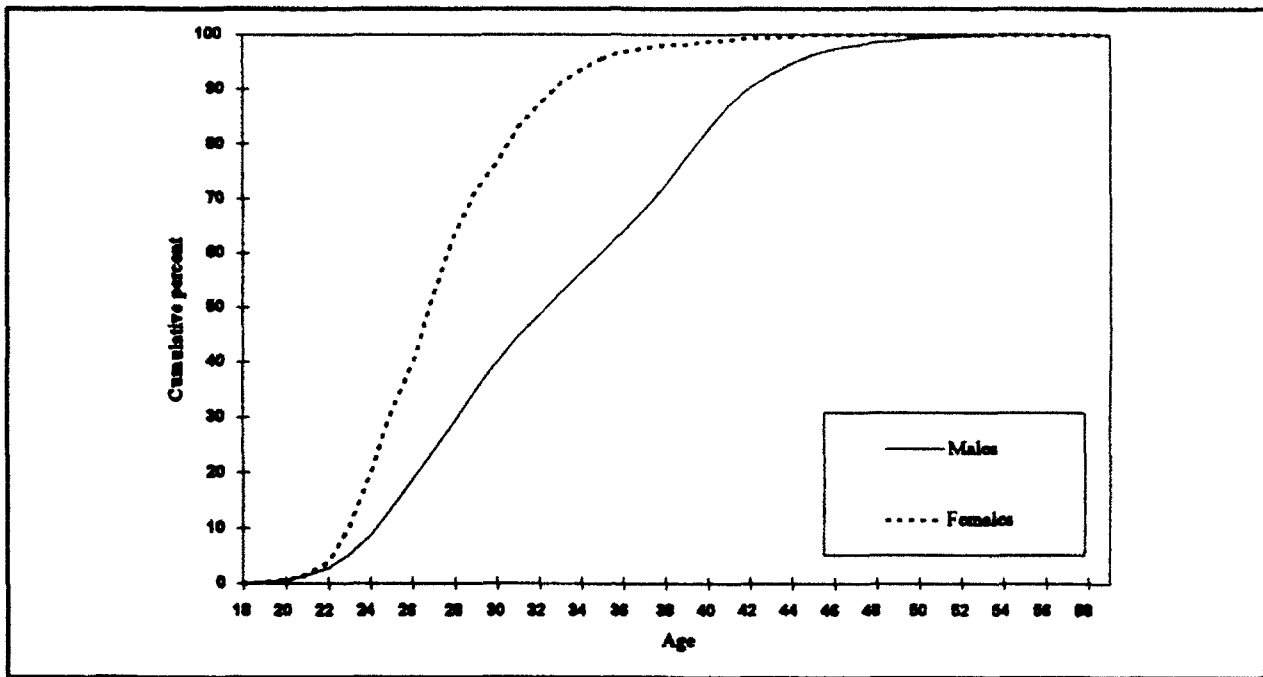


Figure A-1. Gender-specific age distribution of active duty aviators in 1988.

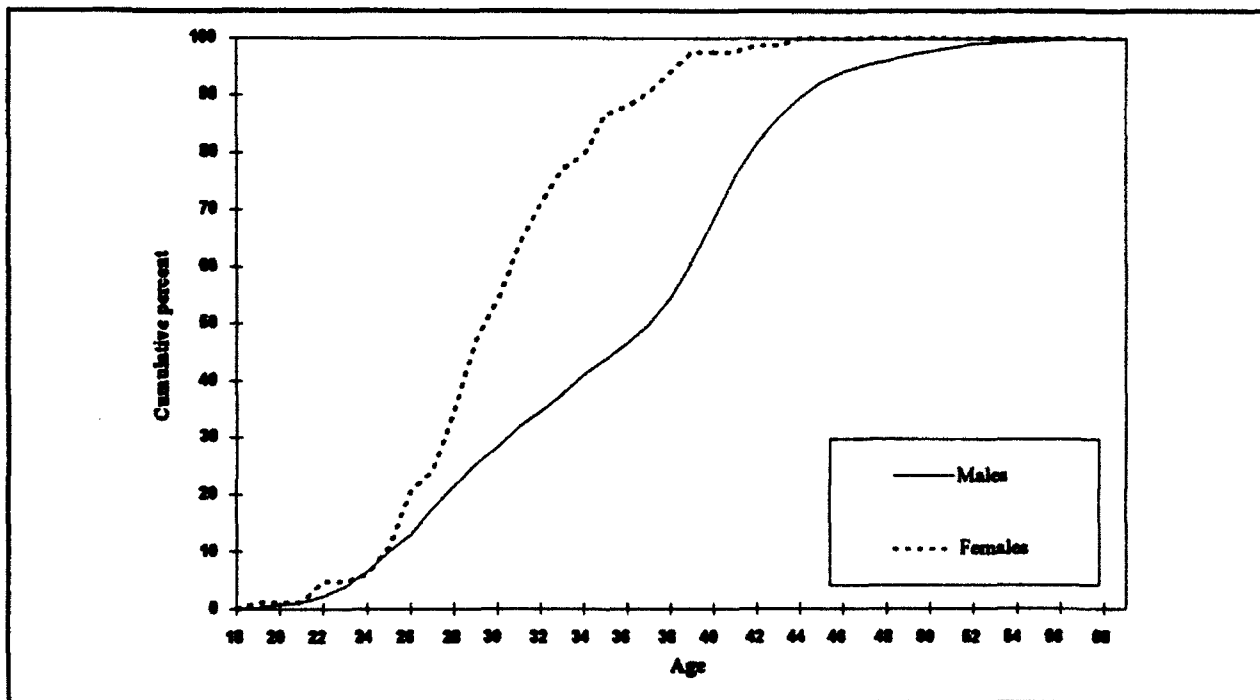


Figure A-2. Gender-specific age distribution of USAR aviators in 1988.

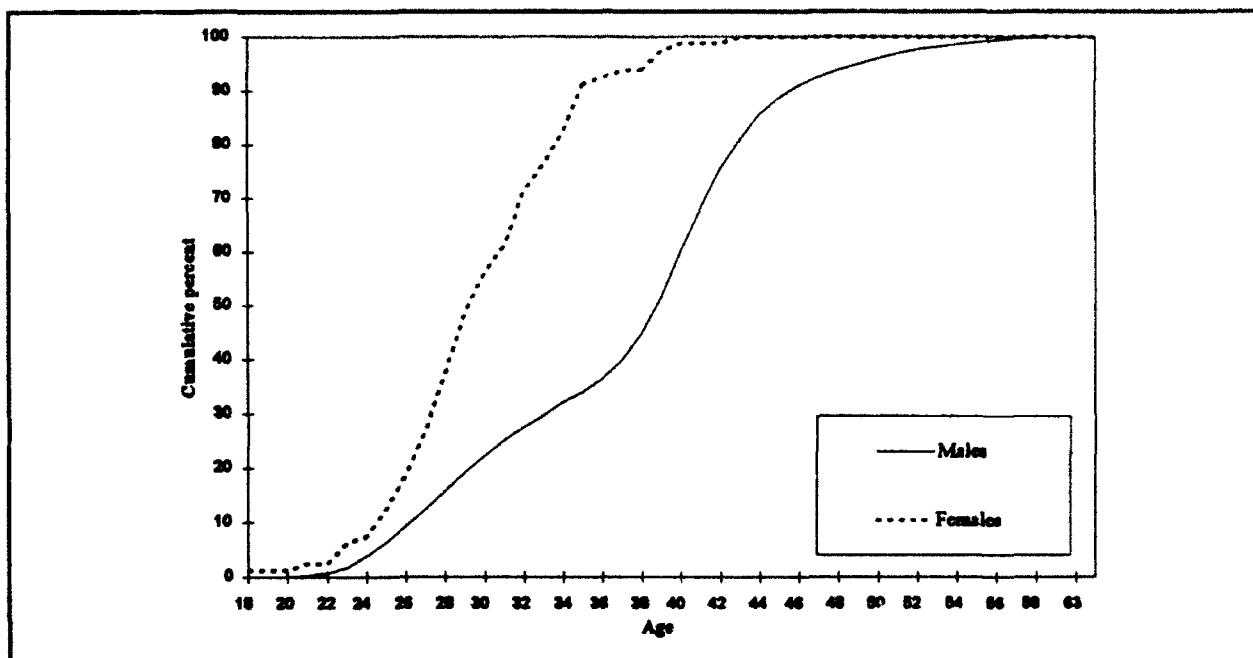


Figure A-3. Gender-specific age distribution of ARNG aviators in 1988.

Initial distribution

Commander, U.S. Army Natick Research,
Development and Engineering Center
ATTN: SATNC-MTL (Documents
Librarian)
Natick, MA 01760-5040

Library
Naval Submarine Medical Research Lab
Box 900, Naval Sub Base
Groton, CT 06349-5900

Chairman
National Transportation Safety Board
800 Independence Avenue, S.W.
Washington, DC 20594

Executive Director, U.S. Army Human
Research and Engineering Directorate
ATTN: Technical Library
Aberdeen Proving Ground, MD 21005

Commander
10th Medical Laboratory
ATTN: Audiologist
APO New York 09180

Commander
Man-Machine Integration System
Code 602
Naval Air Development Center
Warminster, PA 18974

Naval Air Development Center
Technical Information Division
Technical Support Detachment
Warminster, PA 18974

Commander
Naval Air Development Center
ATTN: Code 602-B
Warminster, PA 18974

Commanding Officer, Naval Medical
Research and Development Command
National Naval Medical Center
Bethesda, MD 20814-5044

Commanding Officer
Armstrong Laboratory
Wright-Patterson
Air Force Base, OH 45433-6573

Deputy Director, Defense Research
and Engineering
ATTN: Military Assistant
for Medical and Life Sciences
Washington, DC 20301-3080

Director
Army Audiology and Speech Center
Walter Reed Army Medical Center
Washington, DC 20307-5001

Commander, U.S. Army Research
Institute of Environmental Medicine
Natick, MA 01760

Commander/Director
U.S. Army Combat Surveillance
and Target Acquisition Lab
ATTN: SFAE-IEW-JS
Fort Monmouth, NJ 07703-5305

Director
Federal Aviation Administration
FAA Technical Center
Atlantic City, NJ 08405

Commander, U.S. Army Test
and Evaluation Command
ATTN: AMSTE-AD-H
Aberdeen Proving Ground, MD 21005

Naval Air Systems Command
Technical Air Library 950D
Room 278, Jefferson Plaza II
Department of the Navy
Washington, DC 20361

Director
U.S. Army Ballistic
Research Laboratory
ATTN: DRXBR-OD-ST Tech Reports
Aberdeen Proving Ground, MD 21005

Commander
U.S. Army Medical Research
Institute of Chemical Defense
ATTN: SGRD-UV-AO
Aberdeen Proving Ground,
MD 21010-5425

Commander
USAMRDALC
ATTN: SGRD-RMS
Fort Detrick, Frederick, MD 21702-5012

Director
Walter Reed Army Institute of Research
Washington, DC 20307-5100

HQ DA (DASG-PSP-O)
5109 Leesburg Pike
Falls Church, VA 22041-3258

Harry Diamond Laboratories
ATTN: Technical Information Branch
2800 Powder Mill Road
Adelphi, MD 20783-1197

U.S. Army Materiel Systems
Analysis Agency
ATTN: AMXSY-PA (Reports Processing)
Aberdeen Proving Ground
MD 21005-5071

U.S. Army Ordnance Center
and School Library
Simpson Hall, Building 3071
Aberdeen Proving Ground, MD 21005

U.S. Army Environmental
Hygiene Agency
ATTN: HSHB-MO-A
Aberdeen Proving Ground, MD 21010

Technical Library Chemical Research
and Development Center
Aberdeen Proving Ground, MD
21010-5423

Commander
U.S. Army Medical Research
Institute of Infectious Disease
ATTN: SGRD-UIZ-C
Fort Detrick, Frederick, MD 21702

Director, Biological
Sciences Division
Office of Naval Research
600 North Quincy Street
Arlington, VA 22217

Commander
U.S. Army Materiel Command
ATTN: AMCDE-XS
5001 Eisenhower Avenue
Alexandria, VA 22333

Commandant
U.S. Army Aviation
Logistics School ATTN: ATSQ-TDN
Fort Eustis, VA 23604

Headquarters (ATMD)
U.S. Army Training
and Doctrine Command
ATTN: ATBO-M
Fort Monroe, VA 23651

IAF Liaison Officer for Safety
USAF Safety Agency/SEFF
9750 Avenue G, SE
Kirtland Air Force Base
NM 87117-5671

Naval Aerospace Medical
Institute Library
Building 1953, Code 03L
Pensacola, FL 32508-5600

Command Surgeon
HQ USCENTCOM (CCSG)
U.S. Central Command
MacDill Air Force Base, FL 33608

Air University Library
(AUL/LSE)
Maxwell Air Force Base, AL 36112

U.S. Air Force Institute
of Technology (AFIT/LDEE)
Building 640, Area B
Wright-Patterson
Air Force Base, OH 45433

Henry L. Taylor
Director, Institute of Aviation
University of Illinois-Willard Airport
Savoy, IL 61874

Chief, National Guard Bureau
ATTN: NGB-ARS
Arlington Hall Station
111 South George Mason Drive
Arlington, VA 22204-1382

Commander
U.S. Army Aviation and Troop Command
ATTN: AMSAT-R-ES
4300 Goodfellow Bouvelard
St. Louis, MO 63120-1798

U.S. Army Aviation and Troop Command
Library and Information Center Branch
ATTN: AMSAV-DIL
4300 Goodfellow Boulevard
St. Louis, MO 63120

Federal Aviation Administration
Civil Aeromedical Institute
Library AAM-400A
P.O. Box 25082
Oklahoma City, OK 73125

Commander
U.S. Army Medical Department
and School
ATTN: Library
Fort Sam Houston, TX 78234

Commander
U.S. Army Institute of Surgical Research
ATTN: SGRD-USM
Fort Sam Houston, TX 78234-6200

AAMRL/HEX
Wright-Patterson
Air Force Base, OH 45433

Product Manager
Aviation Life Support Equipment
ATTN: SFAE-AV-LSE
4300 Goodfellow Boulevard
St. Louis, MO 63120-1798

Commander and Director
USAE Waterways Experiment Station
ATTN: CEWES-IM-MI-R,
CD Department
3909 Halls Ferry Road
Vicksburg, MS 39180-6199

Commanding Officer
Naval Biodynamics Laboratory
P.O. Box 24907
New Orleans, LA 70189-0407

Assistant Commandant
U.S. Army Field Artillery School
ATTN: Morris Swott Technical Library
Fort Sill, OK 73503-0312

Mr. Peter Seib
Human Engineering Crew Station
Box 266
Westland Helicopters Limited
Yeovil, Somerset BA20 2YB UK

U.S. Army Dugway Proving Ground
Technical Library, Building 5330
Dugway, UT 84022

U.S. Army Yuma Proving Ground
Technical Library
Yuma, AZ 85364

AFFTC Technical Library
6510 TW/TSTL
Edwards Air Force Base,
CA 93523-5000

Commander
Code 3431
Naval Weapons Center
China Lake, CA 93555

Aeromechanics Laboratory
U.S. Army Research and Technical Labs
Ames Research Center, M/S 215-1
Moffett Field, CA 94035

Sixth U.S. Army
ATTN: SMA
Presidio of San Francisco, CA 94129

Commander
U.S. Army Aeromedical Center
Fort Rucker, AL 36362

Strughold Aeromedical Library
Document Service Section
2511 Kennedy Circle
Brooks Air Force Base, TX 78235-5122

Dr. Diane Damos
Department of Human Factors
ISSM, USC
Los Angeles, CA 90089-0021

U.S. Army White Sands
Missile Range
ATTN: STEWS-IM-ST
White Sands Missile Range, NM 88002

U.S. Army Aviation Engineering
Flight Activity
ATTN: SAVTE-M (Tech Lib) Stop 217
Edwards Air Force Base, CA 93523-5000

Ms. Sandra G. Hart
Ames Research Center
MS 262-3
Moffett Field, CA 94035

Commander
USAMRDALC
ATTN: SGRD-UMZ
Fort Detrick, Frederick, MD 21702-5009

Commander
U.S. Army Health Services Command
ATTN: HSOP-SO
Fort Sam Houston, TX 78234-6000

U. S. Army Research Institute
Aviation R&D Activity
ATTN: PERI-IR
Fort Rucker, AL 36362

Commander
U.S. Army Safety Center
Fort Rucker, AL 36362

U.S. Army Aircraft Development
Test Activity
ATTN: STEBG-MP-P
Cairns Army Air Field
Fort Rucker, AL 36362

Commander
USAMRDALC
ATTN: SGRD-PLC (COL R. Gifford)
Fort Detrick, Frederick, MD 21702

TRADOC Aviation LO
Unit 21551, Box A-209-A
APO AE 09777

Netherlands Army Liaison Office
Building 602
Fort Rucker, AL 36362

British Army Liaison Office
Building 602
Fort Rucker, AL 36362

Italian Army Liaison Office
Building 602
Fort Rucker, AL 36362

Directorate of Training Development
Building 502
Fort Rucker, AL 36362

Chief
USAHEL/USAAVNC Field Office
P. O. Box 716
Fort Rucker, AL 36362-5349

Commander, U.S. Army Aviation Center
and Fort Rucker
ATTN: ATZQ-CG
Fort Rucker, AL 36362

Chief
Test & Evaluation Coordinating Board
Cairns Army Air Field
Fort Rucker, AL 36362

Canadian Army Liaison Office
Building 602
Fort Rucker, AL 36362

German Army Liaison Office
Building 602
Fort Rucker, AL 36362

French Army Liaison Office
USAAVNC (Building 602)
Fort Rucker, AL 36362-5021

Australian Army Liaison Office
Building 602
Fort Rucker, AL 36362

Dr. Garrison Rapmund
6 Burning Tree Court
Bethesda, MD 20817

Commandant, Royal Air Force
Institute of Aviation Medicine
Farnborough, Hampshire GU14 6SZ UK

Defense Technical Information
Cameron Station, Building 5
Alexandra, VA 22304-6145

Commander, U.S. Army Foreign Science
and Technology Center
AIFRTA (Davis)
220 7th Street, NE
Charlottesville, VA 22901-5396

Commander
Applied Technology Laboratory
USARTL-ATCOM
ATTN: Library, Building 401
Fort Eustis, VA 23604

Commander, U.S. Air Force
Development Test Center
101 West D Avenue, Suite 117
Eglin Air Force Base, FL 32542-5495

Aviation Medicine Clinic
TMC #22, SAAF
Fort Bragg, NC 28305

Dr. H. Dix Christensen
Bio-Medical Science Building, Room 753
Post Office Box 26901
Oklahoma City, OK 73190

Commander, U.S. Army Missile
Command
Redstone Scientific Information Center
ATTN: AMSMI-RD-CS-R
/ILL Documents
Redstone Arsenal, AL 35898

Director
Army Personnel Research Establishment
Farnborough, Hants GU14 6SZ UK

U.S. Army Research and Technology
Laboratories (AVSCOM)
Propulsion Laboratory MS 302-2
NASA Lewis Research Center
Cleveland, OH 44135

Commander
USAMRDALC
ATTN: SGRD-ZC (COL John F. Glenn)
Fort Detrick, Frederick, MD 21702-5012

Dr. Eugene S. Channing
166 Baughman's Lane
Frederick, MD 21702-4083

U.S. Army Medical Department
and School
USAMRDALC Liaison
ATTN: HSMC-FR
Fort Sam Houston, TX 78234

Dr. A. Kornfield
895 Head Street
San Francisco, CA 94132-2813

NVESD
AMSEL-RD-NV-ASID-PST
(Attn: Trang Bui)
10221 Burbeck Road
Fort Belvoir, VA 22060-5806

CA Av Med
HQ DAAC
Middle Wallop
Stockbridge, Hants S020 8DY UK

Dr. Christine Schlichting
Behavioral Sciences Department
Box 900, NAVUBASE NLON
Groton, CT 06349-5900

Commander, HQ AAC/SGPA
Aerospace Medicine Branch
162 Dodd Boulevard, Suite 100
Langley Air Force Base,
VA 23665-1995

Commander
Aviation Applied Technology Directorate
ATTN: AMSAT-R-TV
Fort Eustis, VA 23604-5577

COL Yehezkel G. Caine, MD
Surgeon General, Israel Air Force
Aeromedical Center Library
P. O. Box 02166 I.D.F.
Israel

Director
Aviation Research, Development
and Engineering Center
ATTN: AMSAT-R-Z
4300 Goodfellow Boulevard
St. Louis, MO 63120-1798

Commander
USAMRDALC
ATTN: SGRD-ZB (COL C. Fred Tyner)
Fort Detrick, Frederick, MD 21702-5012

Director
Directorate of Combat Developments
ATTN: ATZQ-CD
Building 515
Fort Rucker, AL 36362